sociological science

Who Thinks How? Social Patterns in Reliance on Automatic and Deliberate Cognition

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Abstract: Sociologists increasingly use insights from dual-process models to explain how people think and act. These discussions generally emphasize the influence of cultural knowledge mobilized through automatic cognition, or else show how the use of automatic and deliberate processes vary according to the task at hand or the context. Drawing on insights from sociological theory and suggestive research from social and cognitive psychology, we argue that socially structured experiences also shape general, individual-level preferences (or propensities) for automatic and deliberate thinking. Using a meta-analysis of 63 psychological studies (N = 25,074) and a new multivariate analysis of nationally representative data, we test the hypothesis that the use of automatic and deliberate cognitive processes is socially patterned. We find that education consistently predicts preferences for deliberate processing and that gender predicts preferences for both automatic and deliberate processing. We find that age is a significant but likely nonlinear predictor of preferences for automatic and deliberate cognition, and we find weaker evidence for differences by income, marital status, and religion. These results underscore the need to consider group differences in cognitive processing in sociological explanations of culture, action, and inequality.

Keywords: dual-process models; cognition; cognitive style; culture; action

Citation: Brett, Gordon, and Andrew Miles. 2021. "Who Thinks How? Social Patterns in Reliance on Automatic and Deliberate Cognition." Sociological Science 8: 96-118.

Received: February 10, 2021

Accepted: March 10, 2021

Published: May 10, 2021

Editor(s): Jesper Sørensen, Gabriel Rossman

DOI: 10.15195/v8.a6

One of the most productive developments in cultural sociology over the last two decades has been the incorporation of dual-process models of cognition (see Cerulo 2010; DiMaggio 1997; Leschziner 2019; Lizardo et al. 2016; Vaisey 2009). Dual-process models hold that cognition is of two general kinds. Type 1 processes (which we refer to as *automatic*) execute autonomously when relevant cues are encountered, make minimal demands on working memory, and are often rapid, intuitive, and/or unconscious. Type 2 processes (which we refer to as *deliberate*) are characterized by "cognitive decoupling"[1] and greater demands on working memory and are often conscious, deliberative, and/or analytical (Evans 2008; Evans and Stanovich 2013; Kahneman 2011).

Sociologists have used dual-process models to deepen our understanding of how social and cultural influences generate action (see DiMaggio 1997; Lizardo et al. 2016; Lizardo and Strand 2010; Miles, Charron-Chénier, and Schleifer 2019; Vaisey 2009). Although there has been some attention to the types of cultural content that matter for action (e.g., Miles 2015), most work has focused on specifying the domain-general processes through which cultural knowledge influences behavior. The current consensus is that much cultural knowledge is internalized in a "nondeclarative form" (e.g., as cognitive schemas) that is automatically accessed and applied to action when relevant cues are encountered in the environment (e.g., Lizardo 2017; Lizardo and Strand 2010; Shepherd 2011). Cultural knowledge can also be deliberately employed, but scholars disagree about whether this is a

common or rare occurrence (DiMaggio 1997; Leschziner and Green 2013; Vaisey 2009; Vila-Henninger 2015). These disagreements dovetail with debates about the methods used to study culture, particularly the strengths and limitations of different methods in capturing declarative and nondeclarative cultural knowledge and the value these forms of cultural knowledge hold for explaining action (see Jerolmack and Khan 2014; Pugh 2013; Miles et al. 2019; Vaisey 2009). These differences notwithstanding, all accounts recognize that the relative mix of automatic and deliberate cognition can vary in response to task demands or other situational factors (Lizardo and Strand 2010; Luft 2020; Moore 2017). The resulting picture is one in which factors external to the individual—such as various forms of "public" culture—shape action by activating previously learned forms of "personal" culture and particular cognitive processes (cf. Lizardo 2017).

In this article we argue that social and cultural influences on cognition run deeper than previous work suggests. Although the use of deliberate and automatic cognition certainly responds to external cues, systematic exposure to socially patterned experiences can also create lasting differences in preferences (or propensities) for automatic and deliberate thought. Such differences are known in the psychological literature as cognitive styles or thinking dispositions (see Epstein et al. 1996; Evans and Stanovich 2013:229–31; Frederick 2005; Stanovich 2011). Interestingly, the development of thinking dispositions has been theorized by both classical and contemporary sociologists including Simmel, Dewey, Kohn, and Bourdieu. These accounts differ in the details, but all suggest that thinking dispositions will vary systematically across locations in the social structure to the extent that these locations provide reinforcements and affordances for different styles of thought. Yet determining how social and cultural forces structure cognitive styles is far from a trivial theoretical exercise. Cognitive styles predict differences in a wide range of consequential beliefs and behaviors, including political ideology, racist attitudes, susceptibility to "fake news," and decisiveness in important life domains such as career choice and mate selection (Bago, Rand, and Pennycook 2020; Epstein et al. 1996; Landine 2016; Pacini and Epstein 1999; Pennycook and Rand 2020; Shiloh and Shenhav-Sheffer 2004).

At present, evidence for the social patterning of thinking dispositions is limited. With the notable exception of work in the social structure and personality tradition (e.g., Kohn and Schooler 1978; Kohn et al. 1990), sociologists have generally not tested this claim and have instead focused on how cognitive processing varies across social contexts and cultural domains (Auyero and Switsun 2008; Leschziner and Brett 2019; Martin and Desmond 2010; Moore 2017). The most direct tests have come from psychology, but there group differences in thinking dispositions are rarely a focal concern. Consequently, information about socially patterned variation in cognitive styles is offered with little theoretical explanation and weak analytical justification and typically consists of simple (often bivariate) analyses that yield mixed results. There remains a pressing need for a coherent empirical account of how differences in cognitive styles vary across social groups.

This article tests the theoretical proposition that thinking dispositions are socially learned by examining whether they are patterned by demographic variables that reflect different locations in the social structure. We do this in two parts. First,

we perform a series of meta-analyses of existing research that uses the Rational-Experiential Inventory, a popular measure of individual cognitive styles. These meta-analyses provide a clear picture of the current evidence, but only for a limited number of demographic variables. They also do not address the methodological shortcomings of the underlying studies. In part two, we therefore use multivariate analysis of nationally representative data to examine differences in cognitive processing across a wider range of sociodemographic predictors.

Social Influences on Dual-Process Cognition

Dual-process models have been highly influential in cultural sociology and have been especially generative for research on "culture in action." Although theories about deliberate and dispositional action have long been a part of the sociological canon (see Camic 1986), it was DiMaggio's (1997) agenda-setting "Culture and Cognition" that first explicitly incorporated modern dual-process theorizing into cultural sociology and asserted that automatic or schematic processes were central to understanding and analyzing culture. This agenda was advanced by Vaisey (2009) who argued that automatic, unreflective intuitions strongly predict behavior, whereas deliberate thought is primarily used to make sense of and justify these decisions after the fact. Since then, scholars have used dual-process models to examine a wide range of cultural elements including beliefs, morals, values, attitudes, selves, and worldviews (see Miles 2015; Moore 2017; Srivastava and Banaji 2011; Vaisey 2009; Vaisey and Lizardo 2010) to address important substantive topics ranging from crime to religion (Moore 2017; Rivers, Gibbs, and Paternoster 2017) and to develop more complete frameworks for cultural analysis (e.g., Lizardo 2017; Patterson 2014).

Recent sociological engagement with dual-process models generally ties variation in the use of deliberate and automatic cognition to particular tasks or contexts. For instance, a number of scholars argue that behavior is predominately driven by automatic processing but that deliberate cognition is used for nonroutine tasks such as justifying past behavior, developing new lines of action, or imagining possible futures (e.g., Miles 2015; Mische 2014; Shaw 2015; Srivastava and Banaji 2011; Vaisey 2009). Scholars also examine how the use of automatic and deliberate cognition varies by context, a catch-all term we use to include social situations, physical settings, and broader structural conditions (Harvey 2010; Leschziner and Green 2013; Lizardo and Strand 2010; Luft 2020; Mische 2014; Vaisey 2014). This work suggests that automatic cognition often guides behavior when life is predictable (Auyero and Switsun 2008; Lizardo and Strand 2010) but that deliberate cognition is evoked in novel or problematic situations (Lizardo and Strand 2010; Luft 2020; Shaw 2015; Vaisey 2014).

Implicit in sociological work on dual-process cognition is the assumption that—given a particular type of task in a particular context—cognition will largely operate the same way for everyone. Although *what* we do and *where* we do it certainly influence cognitive processing, few sociologists have explicitly considered that *who* is doing the thinking also matters. However, social and cognitive psychologists have demonstrated that individuals vary systematically in the extent to which they

rely on automatic and deliberate cognition (see Cacioppo et al. 1996; Evans 2008:262; Epstein et al. 1996; Frederick 2005; Stanovich 1999, 2011). These differences are referred to as thinking dispositions or cognitive styles—terms that we will use interchangeably in what follows. Thinking dispositions are broad tendencies in the degree to which individuals use deliberate processing to regulate responses primed by automatic processes (Evans 2008; Pennycook, Fugelsang, and Kohler 2015). Individuals with a *rational/analytical* cognitive style are more likely to engage in and enjoy effortful thinking: they think more extensively, more thoroughly evaluate evidence, more carefully consider future outcomes, and assess their own thinking. An *experiential/intuitive* cognitive style manifests as a greater propensity to "think with your gut" by trusting readily available responses produced by automatic processes (Cacioppo et al. 1996; Epstein et al. 1996; Pennycook et al. 2012; Stanovich 2009, 2011). Cognitive styles are shaped both by differences in cognitive capacities such as working memory and general intelligence (e.g., Barrett, Tugade, and Engle 2004) and by social and cultural learning (Buchtel and Norenzayan 2009).

A number of social theorists have pointed to a key insight into the development of thinking dispositions. Broadly, they argue that people in different social locations are exposed to different types of social and cultural influences, which in turn lead them to develop a more rational or intuitive cognitive style (Bourdieu 2000; Dewey 1933; Rivers et al. 2017; Simmel 1964 [1902]). Sometimes these structural differences correspond to differences in physical locations. Simmel (1964 [1902]), for instance, argued that economic and sensory conditions within cities encourage rational thinking, whereas Rivers et al. (2017) suggested that social conditions and family practices in disadvantaged neighborhoods produce an increased reliance on automatic processes that, over time, can become dispositional. Cognitive styles can also develop within specific institutions. For example, both Dewey (1933) and Bourdieu (2000) saw education as the source of deliberate thinking dispositions, either through an intentional pedagogical process promoting "habits of reflection" or by providing leisurely conditions that allow for the free play of ideas, which in turn facilitate the development of a "scholastic disposition."[2] Within the social structure and personality tradition, Kohn and colleagues argue that social locations that allow for greater self-direction and independent judgment promote "intellectual flexibility," a construct that captures aspects of reflection and logical reasoning (Kohn and Schooler 1978; Kohn et al. 1990; Miller, Kohn, and Schooler 1985). Taken together, sociological work indicates that one's social location facilitates experiences that shape the reliance on deliberate or automatic thought. In particular, urban dwelling, education, and social positions that require independent and complex thinking are expected to encourage deliberate thought, whereas economic disadvantage might predict greater reliance on automatic thought.

Research from the social sciences more broadly identifies additional ways that particular social locations might influence thinking dispositions. For example, evidence suggests that economically disadvantaged people "tunnel" their cognitive resources toward obtaining basic necessities, reducing the amount of cognitive bandwidth available for other tasks (Mani et al. 2013; Mullainathan and Shafir 2013). As Rivers et al. (2017) suggest, repeated experiences of these economic disadvantages over time could lead to a greater overall reliance on automatic

processing. A similar pattern could emerge for single parents and married women, who must often perform greater cognitive labor in managing homes and family finances (Daminger 2019). Men and women might also differ in preferences for automatic and deliberate thinking to the extent that they internalize gendered cultural messages about feminine intuition and masculine rationality (Graham and Ickes 1997). Similarly, religious beliefs might increase "faith" in one's intuitions compared with nonbelievers (Pennycook et al. 2016). Thinking dispositions might also vary with age, although both theory and evidence offer a mixed account. Whereas some scholars suggest that deliberation increases as we age (Stanovich, West, and Toplak 2011), others argue that greater experience and expertise facilitates increased intuitive processing (Epstein 2003), and others still suggest an inverted U-shaped distribution in which deliberation is lower in both adolescence and older age (see Phillips et al. 2016:263).

Existing work gives us good theoretical reasons to believe that thinking dispositions might vary across social categories. Unfortunately, the evidence for this claim is often indirect, inconsistent, or based on studies that are methodologically limited. Within sociology, some research relies on restricted samples that make it difficult to establish whether observed thinking dispositions are general or specific to a particular context or domain. For example, Leschziner and Brett (2019) identify differences in intuitive and analytical thinking in chefs, but they base their conclusions on interviews and observations pertaining specifically to the chefs' careers. Consequently, they cannot determine whether these thinking propensities carry over into the other aspects of the chefs' lives. In other cases, research relies on measures that are likely imperfect proxies for cognitive styles. Work by Kohn and colleagues, for instance, provides strong evidence that particular social locations promote intellectual flexibility, a construct related to a rational cognitive style (e.g., Kohn and Schooler 1978; Kohn et al. 1990). However, intellectual flexibility was partly measured using interviewer ratings of respondents' intelligence (e.g., Kohn and Schooler, 1978). Yet a (normatively) rational response does not necessarily indicate a (cognitively) rational process, and the relationship between intelligence, answer quality, and cognitive processing is not straightforward (see Raoelison, Thompson, and De Neys 2020).

For their part, psychologists have explored the relationship between thinking dispositions and (primarily) three demographic variables: gender, age, and education. A significant advantage of this research is that it makes use of scales designed specifically to capture cognitive styles. Unfortunately, the results have been anything but consistent. Some work finds that men and older individuals exhibit more rational thinking dispositions (e.g., Pacini and Epstein 1999; Sladek, Bond, and Phillips 2010), whereas other studies find no difference (e.g., Landine 2016; McLaughlin et al. 2014). Findings are also mixed as to whether women and older individuals exhibit more intuitive thinking dispositions (see Landine 2016; McLaughlin et al. 2014; Pennycook et al. 2016; Sladek et al. 2010; Thoma et al. 2015). Education is consistently correlated with a stronger rational thinking disposition, but this has primarily been demonstrated among university students who are restricted in age and educational levels (e.g., Aarnio and Lindeman 2005; Welsh et al. 2014). Perhaps most concerning of all, much of this research relies on

convenience samples and measures relationships using bivariate correlations rather than multivariate models with appropriate controls. In fairness to our psychologist colleagues, the large majority of these correlations are presented as descriptive information in studies intended to examine something else. Yet the fact remains that existing psychological work leaves us with shaky evidence at best.

As it stands, the claim that individual cognitive styles vary in socially patterned ways is theoretically compelling but remains empirically unresolved. Addressing this requires work on two fronts. First, inconsistencies in past research must be explained and resolved. We address this challenge in study 1 by performing a series of meta-analyses of studies that use a direct measure of cognitive styles. These meta-analyses provide greater power to detect effects and the possibility of explaining variation across studies. Second, additional evidence is needed that addresses the methodological limitations of existing research. In study 2 we therefore use nationally representative data from the United States to perform multivariate analyses of gender, age, and education along with several additional demographic variables rarely examined in past work.

Data and Methods (Study 1)

Study 1 is a meta-analysis of the relationship of cognitive styles to demographic characteristics. We focused our analysis on studies examining gender, age, and education, as these are the variables most commonly found in published research on cognitive styles. We also restricted our search to research that used the Rational-Experiential Inventory (REI), the most frequently used and arguably the most reliable measure of rational and intuitive thinking dispositions (Betsch and Iannello 2009; Epstein et al. 1996; Phillips et al. 2016). The REI is a self-report measure, but it accurately predicts intuitive and rational responses that are measured with other validated measures of cognitive processing and decision-making and predicts behavior in a way that is consistent with dual-process theories (Betsch 2008; Björklund and Bäckström 2008; Epstein et al. 1996; Pacini and Epstein 1999; Phillips et al. 2016; Witteman et al. 2009).

Literature Search

We searched for both published and unpublished research produced after 1996, the year in which the REI was first validated (Epstein et al. 1996). We located literature using Google Scholar, Web of Science, Scopus, ProQuest, and PsyArXiv using keyword searches for "Rational Experiential Inventory," "REI," "intuitive thinking differences," and "analytical thinking differences." Additionally, we used Google Scholar to find all of the articles that cited three key publications analyzing demographic differences in thinking dispositions using the REI: Epstein et al.'s "Individual Differences in Intuitive–Experiential and Analytical–Rational Thinking Styles" (1996), Pacini and Epstein's "The Relation of Rational and Experiential Information Processing Styles to Personality, Basic Beliefs, and the Ratio-Bias Phenomenon" (1999), and Sladek et al. "Age and Gender Differences in Preferences for Rational and Experiential Thinking" (2010). These search strategies returned

k = 57 studies. Additionally, we contacted researchers who had used the REI and asked if they had unpublished data or unpublished results or if they were aware of scholars currently using the REI in their research: this yielded three data sets. We also contacted researchers through the Society for Judgement and Decision-Making (SJDM) listserv. This yielded an additional four studies and three data sets. We emailed study authors as needed to obtain missing information. If authors did not reply or were unable to provide missing data, the associated estimates were removed from our analysis. We contacted nine authors and in total excluded two articles and a total of eight data points from the meta-analysis.[3]

From this pool we retained all studies that reported the relationship between any version of the REI and at least one of the demographic variables of interest. Versions of the REI include the REI-59 (Epstein, Norris, and Pacini 1995), REI-40 (Pacini and Epstein 1999), REI-31 (Epstein et al. 1996), REI-10 (Norris, Pacini, and Epstein 1998), REI-A (Marks et al. 2008), REIm (Norris and Epstein 2011), and several versions translated into languages other than English (e.g., Monacis et al. 2016). In total we located k = 63 studies from 57 articles, unpublished dissertations, and unpublished data sets, for a total of N = 25,074 participants (see Table A1 in the online supplement). A total of k = 55 studies analyzed gender effects, k = 34 analyzed the effects of age, and k = 17 studies analyzed education effects. A majority of the studies (k = 36 [57 percent]) used the REI-40, followed by the REI-31 (k = 7 [11 percent]) and the REI-10 (k = 7 [11 percent]) with the rest composed of revised or abridged versions of the REI (k = 13 [21 percent]). In terms of sample, the majority of the studies used student populations (k = 37 [59 percent]). The most common country sampled was the United States (k = 18 [29 percent]), but samples also came from Australia, Brazil, Canada, England, Finland, Germany, Iran, Israel, Italy, Slovakia, and Turkey.

Analyses

We converted all effect sizes into correlations (r) prior to analysis using the compute.es package in R (version 3.5.3) (Del Re 2013). We then computed the summary effect of each demographic variable on both rational and intuitive cognitive style using random effects models. Random effects models assume that the true effect sizes vary across studies—a reasonable assumption given the diversity of our samples—and allow this variation to be quantified and explored (Borenstein et al. 2011).

Publication Bias

Because large, significant results are more likely to be published than smaller, nonsignificant ones, summary effects in meta-analyses can overstate the true magnitude of relationships. We address this issue using the "trim-and-fill" method, which aims to estimate what the effect size would be if small, nonsignificant effects had not been excluded from the published record (Duval and Tweedie 2000). In this approach, effect sizes and standard errors from all studies are displayed on a funnel plot centered on the meta-analytic estimate. When publication bias is present, studies lie asymmetrically around the center. An iterative process can be used to impute

the "missing" effects. A bias-corrected estimate of the meta-analytic effect is then calculated using both the original and imputed effects. See Duval and Tweedie (2000) for more details on the method.

Moderators in Analyses of Heterogeneity

We tested for heterogeneity in effects using Cochran's Q and Higgins' I^2 (see Higgins and Thompson 2002). Cochran's Q is the sum of the squared deviations between each study's effect and the overall meta-analytic effect. Cochran's Q can be compared with a distribution with $k - 1$ degrees of freedom to formally test whether variation exists. A significant Q statistic indicates that at least one variable moderates the observed effect size. Higgins' I^2 provides a more interpretable metric for assessing variation in effects. It estimates the percentage of heterogeneity across the primary studies that is not attributable to sampling error. By convention, 25 percent, 50 percent, and 75 percent and greater are considered low, medium, and high levels of heterogeneity (Higgins and Thompson 2002).[4] In cases where between-study heterogeneity was present, we used meta-regression models to try to determine which variables could account for the variation. Meta-regression is similar to simple regression but uses study-level characteristics (e.g., sample size) to explain the variation in effect sizes.

Categorical moderating variables were collapsed to ensure that each category had a minimum of three cases. We created a binary indicator for studies using the REI-40, with all other versions of the REI serving as the reference category. The vocation of each study's sample was categorized as either students, specific occupational groups (e.g., nurses), or samples derived from the general population of a country rather than a specified vocation (the reference category). Study location was separated into Western nations (e.g., Western Europe, United States, Canada, Australia) and non-Western nations (the reference category). Continuous moderators included publication year and logged study sample size. Given the small number of studies, we trimmed models to include only those moderators that predicted study effect sizes with $p < 0.10$.

Results

We estimate random effects meta-analytic models testing the effects of gender, age, and education on both rational and intuitive cognitive styles. Summary effects are presented in Table 1 as correlations (r; see Figures A1 and A2 in the online supplement for forest plots of study effects). Cognitive styles differ across all three predictors. Men tend to be more rational and less intuitive thinkers than women, although the effect sizes are small ($r_{rat} = 0.12$; $r_{int} = -0.10$). In general, age predicts slight increases in rationality ($r = 0.05$). Education has a more substantial effect, with higher education tied to greater rationality ($r = 0.22$). However, all effects exhibit high levels of variability across studies, as indicated by the large heterogeneity statistics (I^2 ranging from 61.09 percent to 97.05 percent).

Are these effects reliable? Figure 1 shows funnel plots for each of the six meta-analyses. The plots generally show good symmetry, suggesting that the initial

Table 1: Summary of Meta-Analyses for Rational and Intuitive Cognitive Styles

Cognitive Style	Demographic Variable	N	K	Effect Size r	95% Confidence Interval Lower	Upper	Heterogeneity of Effect Size I^2, %	Q
Rational	Gender (male)	21,447	50	0.123† (0.017)	0.090	0.156	80.50	195.456*
	Age	10,491	33	0.052* (0.026)	−0.001	0.102	85.36	196.461*
	Education	7,225	17	0.227† (0.057)	0.116	0.339	97.05	2,054.826*
Intuitive	Gender (male)	23,338	53	−0.101† (0.018)	−0.132	−0.070	80.52	219.868*
	Age	9,712	32	0.008 (0.026)	−0.044	0.060	85.66	257.780*
	Education	3,960	15	−0.037 (0.028)	−0.091	0.017	61.09	32.493*

Note: Standard errors are in parentheses. † $p < 0.01$; $*$ $p < 0.05$; two-tailed tests.

Table 2: Trim-and-Fill Estimates of Meta-Analytic Effects

Cognitive Style	Demographic Variable	Estimated Number of Missing Studies Left Side	Right Side	Effect Size Initial	Bias Corrected
Rational	Gender (male)	0	0	0.123† (0.017)	0.123† (0.017)
	Age	0	0	0.052* (0.026)	0.052* (0.026)
	Education	0	6	0.227† (0.057)	0.318† (0.052)
Intuitive	Gender (male)	10	0	−0.101† (0.018)	−0.136† (0.017)
	Age	8	0	0.008 (0.026)	−0.044 (0.028)
	Education	0	1	−0.037 (0.028)	−0.031 (0.027)

Note: Standard errors are in parentheses. † $p < 0.01$; $*$ $p < 0.05$; two-tailed tests.

meta-analytic estimates are relatively unaffected by publication bias. Applying the trim-and-fill method largely confirms this impression. As shown in Table 2, bias-corrected estimates are similar in both direction and magnitude for the majority of effects. The notable exception is the effect of education on rationality, which is *larger* after the bias correction is applied. Although no post hoc method can guarantee an unbiased estimate, the trim-and-fill analysis suggests that publication bias is unlikely to drastically alter the calculated meta-analytic effect sizes.

To explore sources of between-study heterogeneity, we used meta-regression to examine the relationship of effect sizes with potential moderating variables

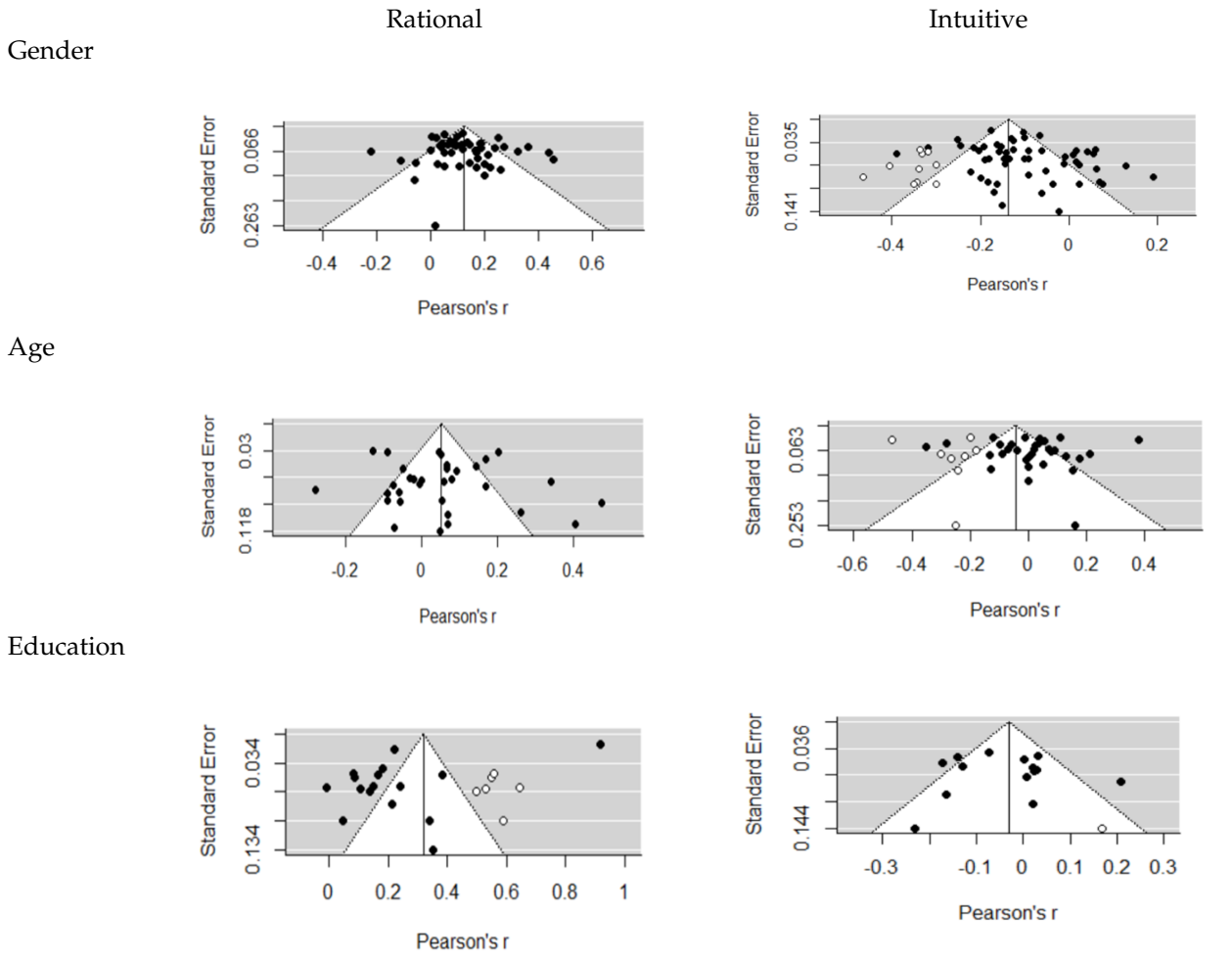

Figure 1: Funnel plots for each meta-analysis. *Note:* The filled circles represent the observed effects sizes, whereas the open circles represent effects sizes that are imputed by the trim-and-fill method.

(Borenstein et al. 2011). Results are shown in Table 3. Of these, only the type of sample drawn matters, and then for only one of the six meta-analytic effects. In particular, general samples show a negative relationship between being male and an intuitive cognitive style, as shown by the intercept (-0.15). Effects in occupational samples, however, are estimated to be close to zero ($-0.15 + 0.11 = -0.04$). Even with this moderating variable in the model, however, substantial heterogeneity in effect sizes remains (I^2 = 78.31 percent).

In sum, our meta-analyses indicate that preferences for automatic and deliberate cognition vary based on gender, age, and education. However, these effects exhibit significant heterogeneity across studies, although this variation is largely unrelated to methodological factors including the type of sample drawn, the location of the study, the version of the REI used, and the size of the sample. Additional work is needed to determine what methodological and/or substantive factors account for this variability.

Table 3: Moderators of Heterogeneity in Effects of Demographic Predictors on Intuitive Cognitive Style

	Intuitive			Intuitive		
	Gender	Age	Education	Gender	Age	Education
Sample Type						
Student	0.049					
	(0.039)					
Occupation	0.111*					
	(0.047)					
Western country						
REI-40						
Sample size (logged)						
Publication year						
Intercept	−0.153	0.008	−0.037	0.123	0.052	0.227
	(0.033)	(0.026)	(0.028)	(0.017)	(0.028)	(0.057)
k	53	32	14	50	33	16
I^2, %	78.31	85.66	61.09	80.5	85.36	97.05

Note: Standard errors are in parentheses. † $p < 0.01$; $*$ $p < 0.05$; two-tailed tests.

An important limitation of this analysis is that meta-analyses are only as reliable as the effects they summarize. Past work linking demographics and cognitive styles is limited by a reliance on nonrepresentative samples, the use of simple (often bivariate) analyses, and a focus on a limited range of demographic variables. Furthermore, meta-analyses can overstate true effects sizes even after corrections for publication bias. Obtaining more realistic estimates typically requires adequately powered replication rather than post hoc modification (Kvarven, Strømland, and Johannesson, 2020). In study 2, we therefore replicate and extend previous work by conducting a new, multivariate analysis of cognitive style in a large, nationally representative sample from the United States. This analysis examines the effects of gender, age, and education but also assesses the contributions of additional demographic variables tied to different social experiences, such as race, religion, employment status, and region of residence.

Data and Methods (Study 2)

Study 2 examines the demographic patterning of cognitive styles using data from the Measuring Morality survey (MMS), a nationally representative survey of the United States administered in 2012 ($N = 1,519$; 61 percent response rate). In addition to gender, education, and age, we included measures of employment status, race, income, geographic region, metropolitan statistical area, religious affiliation, and marital status. We use linear regression to examine the relationships of rational and intuitive cognitive style with these demographic predictors. All models included demographic variables as a set, thereby controlling for shared variation and providing a clearer picture of how each variable relates to cognitive style than previous bivariate analyses. All models used sampling weights and

robust standard errors. Missing data were adjusted for using full-information maximum likelihood (Enders 2010).

Measures

The MMS measures rational cognitive style using a single item from the rationality subscale of the REI-40: "I prefer my life to be filled with puzzles I must solve." Intuitive cognitive style was measured with a single item from the REI-40's experientiality subscale: "I believe in trusting my hunches." Response options for both items ranged from 1 = "Definitely not true of myself" to 5 = "Definitely true of myself." Both items were standardized for analyses.

Using single items is not ideal, but evidence suggests that these items capture the underlying constructs and should approximate the results we would obtain using a multi-item measure. In past research, the rationality measure included in the MMS had one of the highest loadings in both the original test of the REI (Epstein et al. 1996) and in the Need for Cognition scale on which it is based (Cacioppo and Petty 1982). Similarly, our intuition measure consistently has one of the highest correlations and/or factor loadings with the overall experientiality scale (Björklund and Bäckström 2008; Epstein et al. 1996; Handley, Newstead, and Wright 2000; Pacini and Epstein 1999). As a further validity check, we repeated our analyses using four-item versions of each REI subscale that we had transferred to the MMS from a small supplemental data set using multiple imputation (Todosijević 2012). Results were substantively the same, giving us further confidence in the adequacy of our single-item measures (see Table A2 in the online supplement).

We coded age using a series of dummy variables capturing the ranges 18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, 65 to 74, and 75 or greater. Gender is captured by a single indicator, with women coded as 0 and men coded as 1. Education is measured using indicators for having completed some college, a bachelor's degree, and more than a bachelor's degree, with those having completed high school or less serving as the reference category. Employment status is coded as a dichotomous variable, with working coded as 1 and not working coded as 0. Unlike past work, which suggests that the type of job one has can influence cognitive style (e.g., Kohn and Schooler 1978; Kohn et al. 1990), a limitation of our data is that it only captures whether or not someone is currently working. Income contained 19 categories in total, ranging from "less than $5000" to "$175,000 or more." Income was standardized and treated as continuous variable. Marital status is treated as a dichotomous variable, with married coded as 1 and nonmarried (which includes widowed, divorced, separated, never married, and cohabitating) coded as 0. Race is captured with three dichotomous variables: blacks, Hispanics, and other/mixed races, with whites serving as the reference category. Region is coded using binary variables for the Midwest, South, and West, with the Northeast serving as the reference category. Metropolitan statistical area is treated as a dichotomous variable, with metropolitan areas coded as 1 and nonmetropolitan areas coded as 0. Lastly, religious affiliation was coded using indicators for Baptist, mainline Protestant (including Methodist, Lutheran, Presbyterian, and Episcopal), Catholic, Pentecostal, other Christian (either Latter-Day Saints or those who self-identified as "other

Christians"), and non-Christian religions (including Jewish, Muslim, Hindu, Buddhist, and those who self-identified as "other non-Christian"), with nonreligious serving as the reference category. This generally follows the religious classification recommended by Steensland et al. (2000).

Results

Results are presented in Figure 2 (full results are in Table A3 of the online supplement). Measures of rational and intuitive cognitive style are standardized, so coefficients can be interpreted in standard deviation (SD) units. As in study 1, gender and education predict a rational cognitive style, and gender predicts an intuitive cognitive style. In particular, men average nearly a quarter of a SD higher than women on rationality (0.27 SD) but are only modestly lower on intuition (−0.13 SD). Education is also positively tied to rationality, but its effects are restricted to those pursuing postbaccalaureate training. For these individuals, the increase over those with a high school education or less is substantial, averaging 0.43 SD. In contrast to study 1, age predicts intuition and is negatively related to a rational cognitive style, but the effect is nonlinear. The largest difference is between those aged up to 24 years and those aged at least 35 years (−0.44 SD). After age 35, rationality continues to decline, but at a slower rate (peaking at −0.56 SD for those between the ages of 65 and 74). Results for intuition are less consistent, but again the pattern appears nonlinear, with advancing age predicting greater intuitiveness until middle age (peaking at 0.35 SD between the ages of 45 and 54) and then either holding steady or declining into old age.

Figure 2 also indicates that variables beyond gender, age, and education have little to offer our understanding of cognitive styles. The only other variable that predicts rationality is belonging to an "other Christian" group, which includes those who identify themselves as Christian but do not belong to traditional Christian denominations. This effect is reasonably large (−0.21 SD) but only marginally significant ($p = 0.062$). Both marital status and income predict intuitive thinking, but the effect sizes are small. Those who are married average −0.13 SD lower in intuition than the unmarried (although at a marginally significant level, $p = 0.075$). In contrast, those with higher incomes report greater reliance on intuitive thinking, but the effect is quite small, with a 1 SD increase in income predicting a mere 0.09 SD increase in intuition. Overall, our analysis suggests that even after controlling for shared variance across numerous demographic variables, age, education, and gender are the most robust predictors of cognitive style. All other variables were either not significant, marginally significant, and/or had small effects.

Discussion

Recent work by cultural sociologists argues that nondeclarative culture mobilized through automatic cognition plays a disproportionately large role in shaping human behavior but that the use of automatic and deliberate cognition varies based on either the task being performed or the immediate social context. Yet cultural sociol-

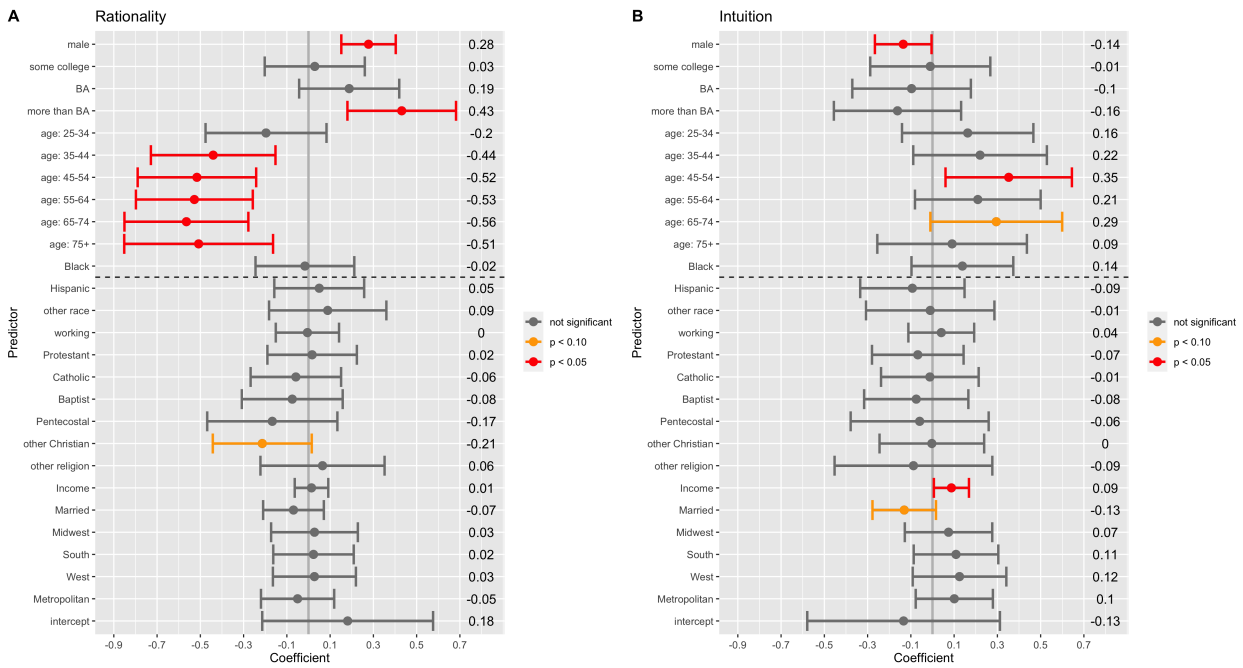

Figure 2: Coefficient plots of linear regressions of cognitive style on demographic variables. Data: Measuring Morality Survey; $N = 1,519$. Figures display point estimates and 95 percent confidence intervals. Point estimates are shown along the right side of each figure.

ogists rarely consider the substantial evidence indicating that cognitive processing also varies based on individual propensities for deliberate or automatic thought known as cognitive styles. Building on work from sociology and psychology, we argue that cognitive styles are formed through experiences patterned by a person's location in the social structure. To test this claim, we examined the relationship between cognitive styles and socially significant demographic variables using both a series of meta-analyses (study 1) and an original analysis of a large, nationally representative data set (study 2).

Our results indicate that dual-process cognition is patterned by a few key demographic variables. The most consistent effects were for gender and education. In both study 1 and study 2, men and the more highly educated reported a more rational cognitive style, indicating a greater preference for deliberate processing, whereas women scored more highly on intuition, suggesting a greater preference for automatic processing. Age also predicted thinking dispositions in both studies, but results were less consistent. In study 1 age predicted a rational but not intuitive cognitive style, whereas in study 2 age predicted greater intuition and lower rationality. These differences could be due to the inclusion of controls in study 2 and/or the use of a large, nationally representative sample that captures a greater range of ages. Another possibility is that the different effects for age in study 1 may reflect the fact that the effects of age are nonlinear and not well captured by pooling outcomes in a meta-analysis. This is consistent with some previous research—and the results from study 2—which found nonlinearities in age effects (Sladek et al. 2010;

see Phillips et al. 2016:263). Study 2 also showed that preferences for automatic processing varied by income and (with marginal significance) by marital status, but these effects were small. Belonging to an "other" Christian group had a modest effect on deliberate processing, but again the effect was only marginally significant. Taken together, these results provide strong evidence that cognitive styles vary by gender, education, and age and weaker evidence for differences by income, marital status, and religion.

These findings have important implications for sociological research on culture, cognition, and action. This work often (implicitly) assumes a "one-size-fits-all" model of cognitive processing in which the relative influence of deliberate and automatic cognition and reflective or dispositional action depends on task demands and situational factors rather than individual differences. Previous research on cognitive styles, however, suggests that any generic claim about the role of automatic or deliberate processes is likely to be imprecise and can be improved by recognizing and incorporating interindividual variation in how cognition is used. In line with scholars like Bourdieu, Kohn, and Simmel, our findings demonstrate that this variation is not random but patterned in socially predictable ways. The fact that thinking disposition are socially structured implies that social and cultural experiences influence not just *what* people think or *when* they think it, but *how* they think. Culture is thus implicated in the most fundamental processes that produce both cognition and action.

This in turn has implications for research connecting culture to inequality and social conflict. Although the relative value of automatic and deliberate cognition is contested, it is well established that the reliance on (automatic) heuristics often leads to imperfect or normatively irrational judgements and choices in important life domains, ranging from financial decision-making to policy preferences to social inferences (Evans 2008; Frederick 2005; Kahneman 2011). This suggests that social patterns in reliance on automatic cognition may translate into socially patterned tendencies to make suboptimal choices that lead to financial or other difficulties. Relatedly, research on the mobilization of cultural capital finds that possessing declarative and nondeclarative cultural knowledge can both be advantageous, although often in different contexts (e.g., Erickson 1996; Farkas et al. 1990). Hence, a general reliance on either automatic or deliberate processing may lead some social groups to miss opportunities and forego the associated rewards. For example, a propensity toward deliberate cognition may help explain why people with advanced educational qualifications more frequently engage in culture talk, an important resource for forming social relationships at work and beyond (Erickson 1996; Lizardo 2016). With regard to social conflict, those with more analytical cognitive styles are more likely to engage in ideologically motivated cognition (Kahan 2013), a fact that might explain why more educated people hold more polarized beliefs on topics like climate change and human evolution (Ballew et al. 2020; Drummond and Fischhoff 2017). These are testable propositions that could flesh out existing research traditions in the sociology of culture.

Social differences in cognitive styles can also inform methodological debates about the relationship between what people say and do and the implications this has for how we study them (see Jerolmack and Khan 2014; Vaisey 2009). Although the

relationship between talk and action may be "variable and problematic" (Jerolmack and Khan 2014:180), group differences in thinking dispositions might account for some of this variability. For example, given that more educated people are, on average, more deliberate thinkers, what they say in interviews or fill in on surveys—arguably contexts that evoke deliberation (Vaisey 2009; Miles et al. 2019)—might better predict how they actually act in the world compared with those with less education. Stated differently, consistency between (declarative) cultural motivations and behavior could be greater for those with a more rational cognitive style and hence for some social groups compared with others. If true, measures of cognitive style or even just demographic indicators could give clues as to how likely it is that "talk" leads to action for a given individual or sample. Of course, it is always preferable to match stated motivations with observed behavior, but this is not always feasible. And when assessing past research, demographic-based heuristics might be all we have to go on.

We encourage researchers to build on this work to better understand how and why individuals vary in their use of cognitive processes. In particular, scholars should attempt to replicate our results using multivariate analyses in large, representative data sets and cross-validate findings using multiple measures of cognitive processing such as the REI (used in this study), the Cognitive Reflection Test (Frederick 2005), the Preference for Intuition and Deliberation Scale (Betsch 2008) and the Situation Specific Thinking Style Scales (Novak and Hoffman 2009). Once we have a clear understanding of how cognitive styles differ and for whom, scholars can begin to investigate the social and cultural mechanisms that translate particular demographic characteristics into differences in cognitive processing. Past work gives us a number of hypotheses to test. Simmel (1964 [1902]), for instance, argued that rational cognitive styles develop through exposure to monetary exchange and heightened sensory stimulation, whereas Bourdieu argued that they develop when individuals are given time and space to engage in imaginative and experimental thought. Others suggest that thinking dispositions may emerge due to particular kinds of parenting and socialization (Rivers et al. 2017; see Lareau 2002) or the complexity of the social environments in which people routinely circulate (Kohn and Schooler 1978; Miller et al. 1985). Longitudinal data will be particularly helpful for observing how these processes unfold and—in the case of achieved characteristics like educational attainment—for disentangling real effects from selection processes. By focusing on changes over time, we can better pinpoint particular social and cultural mechanisms, measure how quickly cognitive styles change, and observe how long these changes persist.

Notes

1 Cognitive decoupling is the process by which a primary representation of the world is copied and decoupled as a secondary representation or a separate possible world, which can subsequently be manipulated or simulated, in particular for hypothetical thinking (Stanovich 2011).

2 Bourdieu (2000) described the scholastic disposition as a hypothetical and decontextualized mode of thought, which is characteristic of deliberate processing.

3 Ares et al. (2014) and Sánchez et al. (2012) were removed from out meta-analysis, as were some of the relevant data points from Cook and Gonzales (2016), Epstein et al. (1996), Handley, Newstead, and Wright (2000), and McGuinness et al. (2017) in which we had insufficient information for their inclusion in our analyses.

4 All analyses were performed using the "compute.es," "meta," and "metafor" packages in R (version 3.5.3; Del Re 2013; Schwarzer 2007; Viechtbauer 2010).

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Acknowledgments: We thank Vanina Leschziner, Martin Lukk, Lance Stewart, and Lawrence Williams for their very helpful feedback on an early draft of this article.

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